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Section I

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Cost Accounting for Coal Mines

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The Colorado Fuel & Iron Company,

Pueblo, Colorado

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The National Association of Cost Accountants does not stand sponsor for views expressed by the writers of articles issued as Publications. The object of the Official Publications of the Association is to place before the members ideas which it is hoped may prove interesting and suggestive. The articles will cover a wide range of subjects and present many different viewpoints. It is not intended that they shall reflect the particular ideas of any individual or group. Constructive comments on any of the Publications will be welcome.

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EDITORIAL DEPARTMENT NOTE

It is a generally recognized fact that a majority of the failures of cost systems to operate properly and effectively are caused by the lack of understanding and cooperation among the cost department, the factory superintendents and foremen, and the management. As the original source of most of the cost information lies with the factory superintendents and foremen, the cost man must secure their cooperation in order to get accurate and complete cost information promptly. And if such cost information is to be used as a guide to management in the formulation of policies, it should be prepared and presented promptly to the management in such form that it can be easily and quickly interpreted. In the formulation of their policies the management may often get excellent suggestions from their superintendents and foremen. It should be a thoroughly cooperative affair and the cost man seems to be the logical one to bring about this understanding and cooperation. In this issue of our Bulletin we are presenting to our members a discussion of one case in which the type of cooperation to which the Editor has just referred has brought about highly satisfactory results.

The author of this paper, Mr. J. A. Bullington, was born in Nashville, Tennessee. After attending the public schools of Tennessee and Texas, he attended the University of Texas. His first industrial experience was with the coal mines of Southern Colorado in 1907. He took a course in Mining Engineering and was Mine Superintendent for the National Fuel Company at Green Canon, Colorado, in 1910. In 1913 he went to the Primas Chemical Company, miners of Tungsten and Vanadium, as Metallurgical Accountant. Just after the World War, he went to the Smuggler-Union Gold Mining Company as Chief Storekeeper, which position he held until 1923, when he went to the Colorado Iron and Fuel Company as Cost Accountant. He is still with that company in the capacity of Assistant Comptroller.

This paper was delivered before the Rocky Mountain Coal Mining Institute at Denver, Colorado, June 5, 1931.

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NATIONAL ASSOCIATION OF
COST ACCOUNTANTS
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COST ACCOUNTING FOR COAL MINES

ALL accounting is classed as overhead expense and as such must justify its cost through the service it renders to the organization.

Our problem, therefore, is to make the Cost Department pay its own way by the service it gives the operating departments.

In order to do this we must secure the fullest cooperation between the cost man and the mine management by seeing that the cost men are thoroughly familiar with all operations of the mine and also familiar with the terms used by the mine men that they may both talk the same language.

It is also very necessary that the cost man dispense with any feeling of superior intelligence and make himself agreeable instead of obnoxious to the operating men with whom he deals.

You have all, no doubt, seen perfectly good cost sheets, made on excellent paper, promptly filed in the waste basket because the operating man for whom they were made could not understand them.

In fact, many costs are hidden in such a maze of figures that it is impossible for anyone not a trained accountant familiar with all the vagaries of the particular system to tell from the cost sheet what the real costs are.

Another important thing for the cost man to keep before him is that every figure put on his cost sheet must represent the result of some actual operation, and he should be willing at all times, and, in fact, anxious, to give the operating man a full explanation of any charges which appear on the cost sheet.

In the past the cost men have usually felt that when they have put out a set of cost sheets which balance and are perfect from the accounting standpoint they should be satisfied. But they have then only begun their job, and are not finished with it until every operating man who gets the cost sheet understands thoroughly every figure on it, and just what it represents as related to his operation.

It should, therefore, be the object of every member of the cost department to miss no opportunity to go over the cost sheets with any operating man whom he can get to do this, and it would also stand the operating man well in hand to get in the same frame of

mind and utilize the cost man's knowledge of figures at every available opportunity to secure a better understanding of just what his cost sheets mean. It is by this means that operating men become cost-conscious.

As an illustration, cost accounting has been compared with the speedometer on an automobile. It measures the results accomplished by the operation of a mine the same as the speedometer measures results accomplished by a car. The speedometer for the average car will cost about 1% of the total cost of the car. A properly designed and operated cost system should not cost over one-half of 1% of the total mine costs, so from the standpoint of money spent we could say that it is cheaper to have a cost system on a coal mine than it is to have a speedometer on an automobile.

Going further, we might compare the yearly cost with the total mileage on your car, then the monthly cost would compare with the trip mileage, and the daily cost control would compare with the miles-per-hour figure on the speedometer.

You all have heard the old saying, "Take care of the dimes and the dollars will take care of themselves", so in this case if we take care of the daily cost, the monthly cost and yearly cost must of necessity be taken care of at the same time.

We will now take up the operation of the daily features of the cost system. This daily cost is the figure that closes the gap between the cost record and the work. It measures the work done currently and is comparable with the rate of travel of your automobile, that is, miles per hour.

Everyone, no doubt, has yearly and monthly cost sheets, and possibly others covering longer periods, but to control the costs as they originate we must get closer to their source, getting our information more quickly, that we may discover the leaks and stop them before they grow too large. In doing this it is very easy to spend more money on the details of the cost system than the mine can afford.

The most satisfactory method of handling current costs is through the setting of standards on costs, and budgets on production and expense. When we consider the ordinary coal mine we find that approximately 75% of the mine cost for which the superintendent is responsible and over which he has control is for labor, about 13%

is for supplies, around 5% will cover power used, while management and incidental expenses will run around 7%. It is evident from this that if the labor cost can be controlled by use of standards and budgets we have licked 75% of our problem and this is where the big chance for a saving lies.

We could feel then, that if we could get everyone who is in a supervisory capacity to think along the line of economy in labor, they would naturally fall into the same line of thought on the supplies they use and the power consumed, giving the same net result to the organization as if we had spent the money to put a daily control on each of these items.

We have developed what we call a Standard Daily Force Report and Labor Cost Sheet which we have been using on cost reduction for the past few years, and which we will call Exhibit No. 1. In setting up this standard force report we found it advisable first to sell the idea thoroughly to the management and through them to each superintendent and mine foreman. This was all done in open conferences across the table, and there was developed considerable argument for or against an additional driver or an additional pump man, timber man, etc. But in the end, agreement was reached among the general superintendent, mine superintendents and foremen, and the cost department. With these standards of labor as a basis we figured the budgeted expense per day and per month.

Having set up the number of men required for each job as a standard, we considered then the tonnage which the mine should produce with this number of men working, and after some argument it was agreed that a certain tonnage should be produced under normal operating conditions. We thus reached our Production Budget per day and per month.

By having the superintendents and foremen help in setting the standards and budgets they were as deeply interested in how it would work out as we were. Consequently, when we presented to them the finished figures they could only get busy and meet them as they had agreed the budgets could be attained.

This is the point on which so many cost systems fail. That is, lack of mutual understanding and agreement in installation.

During the first six months that we used this plan we reduced our labor forces and increased our production enough to show a very substantial saving to the company in actual operating ex-

FUEL DIVISION
DAILY FORCE REPORT AND LABOR COST

PICTOU MINE Date _____, 193__

OCCUPATION	STANDARD Idle	STANDARD Req.	Act.	Rate	AMOUNT	OCCUPATION	STANDARD Idle	STANDARD Req.	Act.	Rate	AMOUNT
Weighman S. S. Cars and Wash Proprietor		1				Foreman	1	1			
Weighman Pit Cars		1				Asst. Foreman	1	1			
Dumper		2				Fire Boss	2	2			
Bar Car Loader Slopper		1				Shot Firers		2			
Tipplemen Trim S. S. Cars		1				Driver Boss	1	1			
Cabbie		1				Drivers (1 or 2 Mules)		16			
Car Dropper		1				Drivers (3 or more Mules)		1			
Tipplemen		2				Trappers		1			
Slate Picker		2				Timbermen	2	2			
Tipplemen On Pit Cars		1				Trackmen	2	2			
Stable Boss	1	1				Miners		1			
Trammers		8				Shotmen		2			
Shortriden	1	1				Rope Riders		7			
Lampmen	1	1				Motormen		1			
Machinist	1	1				Lineman		1			
Blacksmith	1	1									
Blacksmith Helper		1									
Car Repairer		1									
Hoist Engineer		1									
Watchmen	2	2									
Jigmen in Washery		1									
Load S. S. Cars at Washery		1									
Laborer and Chute Work Mines	1	1									
Rock Hoist		1									
						TOTAL INSIDE	9	50			
						Coal Breakers		2			
TOTAL OUTSIDE	7	23				TOTAL MISCELLANEOUS		2			

					Cost Per Ton	AMOUNT
No. Miners						
No. Ch. Men		Inside Cost				
Avg. Tons per Miner		Outside Cost				
Avg. Tons per Ch. Man		Supervision and Clerical				
		Tarbogs	Tons @			
		Development	Tons @			
		Full Miners	Tons @			
		Full Miners	Tons @			
		Full Miners	Tons @			
		Ch. Coal	Tons @			
Budget Production this		Actual Production	Tons	Cost		
		Brought Forward	Tons	Cost		
Previous Month	Standard 21.97	To Date	Tons	Cost		
Days Worked		Average Production	Tons			
Cars Dumped Today		Average Tons Per Car				
Cars Dumped This Month		Average Tons Per Car				
Average Tons Per Car Last Month						
Remarks						

Signed _____ Superintendent

EXHIBIT 1

MINING DEPARTMENT
COST SHEET

		ACTUAL COST		STAND COST	ACT. OVER STAND.		ACT. UNDER STAND.	
		Amount	Per Ton		Amount	Per Ton	Amount	Per Ton
000	Mining Coal							
007	Transportation							
010	Preparation of Coal							
	Sacking, Boxing and Trucking							
011	Mine Maintenance							
012	Repairs							
	Mine Management							
020	Powder Fuse and Caps							
021	Sacking							
030	Lamps							
032	Bath House							
034	Workmen's Compensation							
	Power							
	TOTAL OPERATING COSTS							
040	General Management							
041	Engineering							
042	Employees Service							
043	Industrial Relations							
044	Royalty							
045	Fire Insurance							
046	Allowance Account Quality							
	State Inspection Fund							
	TOTAL							
	TOTAL COST							
	Variation Due to Screening Practice							
	CREDIT AT STANDARD							
	PLANT BALANCE							
	Per Cent of Standard							

	THIS MONTH		TO DATE THIS YEAR	
	ACTUAL	BUDGET	ACTUAL	BUDGET
Production, Tons				
Days Worked				
Average Tons per Day				
Average No. Miners				
Average Tons per Miner per Day				
Average Number Company Men				
Average Tons per Company Man per Day				

EXHIBIT HAND MINING		AMOUNT	EXHIBIT MACHINE MINING		AMOUNT
Tons			Tons		
Tons			Tons		
Tons			Yards Room Brushing		
Yards Room Brushing					
Room Timbers Sets			Room Timbers Sets		
			Repair Mining Machines		
			Power		
Shift Work and Misc. Supplies			Shift Work and Misc. Supplies		
Tons Cost per Ton			Tons Cost per Ton		

ANALYSIS OF PLANT BALANCE:

SCREENING PRACTICE	ACTUAL	STANDARD
Lump	%	%
Nut	%	%
Pea	%	%
Slack	%	%

Development Expenditures
Months Act.
Months Std.
Reasons

_____ MINE NO. _____ STANDARD COST SHEET Month of _____ 19__

EXHIBIT 2

pense. This saving was made by the operating men of their own accord by suggesting further reductions in expense and by increasing their production.

We will now show, as Exhibit No. 2, the Monthly Cost Report which was the outcome of this daily control of costs. This monthly cost sheet is designed for the use of both the mine superintendent and general management, and should contain as few figures as possible to tell the whole story in a comprehensive manner, using expense exhibits for the explanation of detail. This cost sheet is divided into two parts; the top part, or what we call "Total Operating Costs", represents the costs which are directly under control of the mine superintendent, while the general expenses are added on at the bottom as a separate section, to get the "Total Cost". The idea in doing this is to give the mine superintendent a figure which represents the results of his efforts toward controlling the costs at his mine, and his figures should not be mixed up with general expense and other items over which he has no control, as this only leaves the whole sheet open to question as to why the cost is up or down and gives him a chance to alibi when costs go up. Variations from the standard are pointed out and are thoroughly analyzed by the cost department in a report given to general management.

In the nature of the coal business the operation of the mine is very seasonable, and in the last few years has been more or less erratic, even in the busy esason. It would be impossible to set a standard operating cost that would apply month after month, as some months the mine will run 5 days or less, some months 10 days, and occasionally full time.

This makes it necessary to set up a statement of standard expense for idle days, Exhibit No. 3. The idle days standard should include the actual cost of laying the mine idle for one day, such as the superintendent's salary, office expense, pit boss, inspectors, fan and pump operators and other men who are required to work to keep the mine open, whether coal is hoisted or not. This idle day standard, multiplied by the number of days lost from regular working time, gives us a figure which is deducted from the total cost before figuring the actual cost of production for the month. This figure may be called the idle time cost of the mine and is not considered a part of the cost of mining coal, but is rather considered

as the cost of laying the mine idle for the days on which no coal is produced. The total cost, less the standard idle expense for the month, gives us a cost for which we can hold the operation of the mine strictly responsible.

IDLE DAY STANDARDS

Account	*Mine*
10—Mule Haulage	$ 76.97
25—Ventilation	11.67
26—Timbering	13.34
27—Track Maintenance	13.34
28—Handling Rock	13.14
29—Drainage	27.13
31—Rock Dusting	13.14
32—Mine Top	5.04
67—Supervision & Clerical	20.97
68—Mine Supervision	31.05
Power	115.22
TOTAL	$341.01
Labor Portion of Total	$209.71
Supplies Portion of Total	$131.30
Supplies Consist of	
Feed	$ 59.18
Power	$ 72.12

EXHIBIT 3

You all know the result on the final profit and loss sheet when you screen 10% more slack and 10% less lump than there should be. Because of the nature of the operation of a coal mine, the slack costs just as much per ton to mine as lump, but brings only a fraction as much in the market when sold. We, therefore, set up what we call standard screening practice for each mine, and through the operation of this standard we can show each month on the cost sheet just what is gained or lost by variations from this standard. If more lump or nut than standard is made it will reflect as a credit balance to the mine. If less nut or lump and more slack than stand-

ard is made we will charge the mine with the loss, holding it as a balance against them until they overcome it by decreasing the slack percentage, showing on the cost sheet each month just how the balance stands.

This gives you in brief form the salient points of our mine cost system as we have developed it after three years' experience. We have not stopped, however, but are continually on the lookout for improvements and new ideas which will help us in getting better results through the use of our cost sheets.

By far the major portion of the credit for the excellent results we have shown through the use of this method of costs is due to the members of the operating department who, recognizing the possibilities of a progressive cost system, have labored long hours with us, perfecting various phases of this work.

In closing I will set forth a few points which we have found indispensable in working out and applying the cost system as above outlined:

1. Higher management must feel the need of a better control of costs and be willing to cooperate in installing and operating the system.
2. A competent cost man who is enough of a salesman to put his ideas over is essential.
3. Thorough cooperation among general management, mine superintendents, foremen and cost accountants is necessary in setting up standards of performance and budgeting operations.
4. Remember—no cost system will run itself. After proper installation a constant check must be kept and new ideas analyzed and developed into usable methods.

   Progress is made on the assumption that the usual way of doing anything is probably the wrong way.
5. Never confuse what should be done with what is being done in connection with your costs.

   The fact that an idea or method is old does not, of necessity, mean that it is not good; and conversely, the fact that an idea is new does not necessarily mean that it is good.

Therefore, we must prove all points and take nothing for granted when setting up a cost system, for facts, and facts alone, are safe to build plans on.

All this may seem like a lot of trouble to an operating man but

in the last analysis our income is usually closely related to our troubles.

The ideas herein set forth are not new but have been advanced by the leading industrial and management engineers. We have only tried to adapt them to our needs.

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